

CLAIMS:

1. A plasma generation apparatus for processing material under process using plasma, the apparatus comprising:
 - a power electrode separated from the material under process at a predetermined
 - 5 interval;
 - a first dielectric layer interposed between the power electrode and the material under process;
 - an auxiliary plasma earth electrode disposed adjacent to the power electrode and generating auxiliary plasma using the power smaller than main plasma generated
 - 10 between the power electrode and the material under process;
 - a second dielectric layer interposed between the power electrode and the AP earth electrode;
 - a gas flow portion for providing mixed gas to a space between the power electrode and the AP earth electrode for plasma reaction; and
 - 15 a power controller controlling RF power supplied to the power electrode.
2. The apparatus of claim 1, further comprising an MP earth electrode, which faces the power electrode and is disposed adjacent to the material under process, for generating main plasma.
- 20 3. The apparatus of claim 2, wherein the MP earth electrode includes a conveyer belt for transporting the material under process while maintaining an earth state.
4. The apparatus of claim 1, further comprising:
 - 25 a capacitance earth electrode disposed adjacent to the power electrode; and
 - a third dielectric layer interposed between the capacitance earth electrode and the power electrode.
5. A plasma generation apparatus for processing material under process using plasma, the apparatus comprising:
 - 30 a power electrode separated from the material under process at a predetermined interval;

a first dielectric layer interposed between the power electrode and the material under process;

an earth body including an AP earth electrode disposed adjacent to the power electrode and generating auxiliary plasma using the power smaller than the power used in generating main plasma generated between the power electrode and the material under process and a capacitance earth electrode disposed adjacent to the power electrode and forming a single body with the AP earth electrode;

a second dielectric layer interposed between the power electrode and the earth body;

a gas flow portion for providing mixed gas to a space between the power electrode and the AP earth electrode; and

a power controller controlling RF power supplied to the power electrode.

6. The apparatus of claim 5, wherein:

the power electrode is formed in a panel shape and disposed above the material under process at a predetermined interval; and

the earth body is formed in a panel shape in which the AP earth electrode and the capacitance earth electrode face the power electrode covered by the second dielectric layer.

7. The apparatus of claim 5, wherein the gas flow portion includes:

a first flow path in which the mixed gas flows from the outside;

a second flow path connected to the first flow path and formed parallel to the power electrode; and

a plurality of orifices formed on the inner wall of the second flow path in order to provide the mixed gas to the power electrode.

8. The apparatus of claim 7, wherein:

the gas flow portion further includes an inflow chamber provided between the AP earth electrode and the dielectric layer; and

the orifices connecting the second flow path to the inflow chamber.

9. The apparatus of claim 5, further comprising:
a discharge needle disposed between the AP earth electrode and the second dielectric layer; and
an igniter electrically connected to the discharge needle.
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10. The apparatus of claim 9, wherein a lead wire connecting the discharge needle to the igniter includes a gap having a predetermined space.
11. The apparatus of claim 5, wherein:
10 a plurality of the power electrodes are arranged in a row and vertical to a transportation path of the material under process;
the first and second dielectric layers are formed on the surface of the power electrode; and
each of the earth bodies is interposed between the power electrodes.
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12. A plasma generation apparatus for processing material under process using plasma, the apparatus comprising:
a power electrode formed in a cylindrical shape and separated from the material under process at a predetermined interval;
20 a dielectric layer covering the circumference of the power electrode;
an AP earth electrode disposed adjacent to the power electrode and generating auxiliary plasma using the power smaller than the power used in generating main plasma generated between the power electrode and the material under process;
a gas flow portion for providing a reaction gas to a space between the power
25 electrode and the AP earth electrode; and
a power controller controlling RF power supplied to the power electrode.
13. The apparatus of claim 12, further comprising an MP earth electrode contacting the material under process and facing the power electrode.
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14. The apparatus of claim 13, wherein the MP earth electrode includes a conveyer belt transporting the material under process while maintaining an earth state.

15. The apparatus of claim 12, further comprising a capacitance earth electrode partially containing the power electrode and the dielectric layer.
16. The apparatus of claim 15, wherein:
5 the capacitance earth electrode and the AP earth electrode are formed in a single body to form an earth body; and
the gas flow portion includes a gas flow path formed in the earth body.
17. The apparatus of claim 16, wherein:
10 a portion of the dielectric layer is exposed from the bottom of the earth body; and
the AP earth electrode is installed adjacent to the exposed portion of the dielectric layer.
18. The apparatus of claim 16, wherein the gas flow portion includes:
a first flow path in which the reaction gas flows from the outside;
a second flow path formed parallel to the power electrode and connected to the first flow path; and
a plurality of orifices formed on the inner wall of the second flow path in order
15 to provide the reaction gas to the power electrode covered by the dielectric layer.
19. The apparatus of claim 18, wherein:
the gas flow portion further includes an inflow chamber provided between the AP earth electrode and the dielectric layer; and
25 the plurality of orifices connects the second flow path to the inflow chamber.
20. The apparatus of claim 12, wherein:
the dielectric layer is formed as hollow body; and
the inside diameter of the dielectric layer is longer than the outside diameter of
30 the power electrode.
21. The apparatus of claim 12, wherein:

grooves are formed on the surface of the power electrode; and
the grooves face the material under process.

22. The apparatus of claim 12, further comprising:
5 a discharge needle disposed between the AP earth electrode and the dielectric layer or between the MP earth electrode and the dielectric layer; and
an igniter electrically connected to the discharge needle.
23. The apparatus of claim 22, wherein a lead wire connecting the discharge needle
10 to the igniter includes a gap having a predetermined space.
24. The apparatus of claim 12, wherein:
a plurality of the power electrodes covered by the dielectric layers are arranged
in a row and disposed vertical to a transportation path of the material under process; and
15 each of the AP earth electrodes is installed adjacent to the dielectric layer.
25. The apparatus of claim 12, wherein:
a plurality of the power electrodes and the dielectric layers are arranged in a
row and disposed top and bottom of the transportation path of the material under
20 process; and
the AP earth electrodes are installed adjacent to the dielectric layers,
respectively.
26. The apparatus of claim 12, wherein the power electrode is formed in a shape of
25 a cylinder or a polygon prism.
27. The apparatus of claim 12, wherein the power electrode and the dielectric layer
have an uneven portion of the surface.
- 30 28. The apparatus of claim 12, wherein the AP earth electrode and the gas flow
portion are provided at the both sides of the power electrode covered by the dielectric
layer, respectively.